AMENDMENTS TO THE CLAIMS:

1. (Currently amended) A method for ~~efficient operation of a two-dimensional MEMS~~ operating a micromechanical grating, said method comprising:

providing a micromechanical grating having a two dimensional array of deflectable elements, each element operable to tilt about an axis to a tilt angle and spaced apart from adjacent elements by a grating pitch;

selecting a wavelength (λ) of near monochromatic spatially coherent light;

~~determining a grating pitch,~~ selecting an angle of incidence~~, a tilt angle,~~ and a diffraction order satisfying ~~to satisfy~~:

$$\theta_t(\theta_i, n) = 1/2 \{\arcsin [(n \lambda / d)\sqrt{2} - \sin (\theta_i)] + \theta_i \}$$

where:

θ_t is a tilt angle relative to said [[~~MEMS~~]] micromechanical grating normal,

θ_i is an angle of incidence relative to said [[~~MEMS~~]] micromechanical grating normal,

n is a diffraction order,

λ is a wavelength of incident near monochromatic spatially coherent light, and

d is a pixel grating pitch of said [[~~MEMS~~]] micromechanical grating.

2. (Original) The method of Claim 1, wherein a center of a Fraunhofer envelope is aligned with said n^{th} diffraction order.

3. (Currently amended) The method of Claim 1, said ~~determining a grating pitch,~~ selecting an angle of incidence ~~incident, a tilt angle,~~ and a diffraction order comprising determining a grating pitch and a tilt angle for a micromirror device.

4. (Currently amended) The method of Claim 1, comprising:

illuminating said [[~~MEMS~~]] micromechanical grating with near monotonic spatially coherent light at said angle of incidence; and

collecting said near monotonic spatially coherent light from said n^{th} diffraction

order.

5. (Original) The method of Claim 4, said illuminating performed such that said illumination light and said collected light traverse a common path.

6. (Currently amended) The method of Claim 4, ~~said determining a grating pitch, an angle of incident, a tilt angle, and a diffraction order comprising determining a grating pitch and a tilt angle for a micromirror device,~~ said illuminating performed such that said illumination light and said collected light traverse a common path, said common path normal to a tilted said deflectable element of said micromechanical grating ~~micromirror of said micromirror device~~.

7. (Currently amended) A micromirror device comprising:

a two-dimensional array of deflectable mirrors, said array having a pitch distance (d) between adjacent mirrors;

a support corresponding to each deflectable mirror such that each deflectable mirror can deflect to a tilt angle ~~a deflectable member supporting each said mirror, said deflectable member establishing a tilt angle for each its corresponding mirror~~; and

wherein said micromirror device is blazed for near monochromatic spatially coherent light having a wavelength in the range of 1480-1580 nm.

8. (Currently amended) The micromirror device of Claim 7, wherein said micromirror device is blazed in the Littrow condition for near monochromatic spatially coherent light at said angle of incidence having a wavelength in the range of 1480-1580 nm.

9. (Currently amended) A system ~~for fiber optic/telecommunication switching/modulating applications,~~ comprising:

an optical grating;

one or more near monochromatic spatially coherent light input signals coupled to said optical grating, said optical grating converting said light into collimated channels of varying frequency, said collimated light being passed through condensing optics on to the surface of a micromirror device;

said micromirror device comprising:

a two-dimensional array of deflectable mirrors, said array having a pitch distance (d) between adjacent mirrors; and

a support corresponding to each deflectable mirror such that each deflectable mirror can deflect to a tilt angle ~~a deflectable member supporting each said mirror, said deflectable member establishing a tilt angle for its corresponding mirror~~; and

wherein said micromirror device is blazed for said near monochromatic spatially coherent light ~~having a wavelength in the range of 1480-1580 nm~~.

10. (Original) The system of Claim 9, said system operable to selectively add or remove frequency channels from said light.

11. (Original) The system of Claim 9, said system operable to selectively modulate frequency channels from said light.

12. (Original) The system of Claim 9, said system operable to selectively switch frequency channels from said light.

13. (Original) The system of Claim 9, said system operable to selectively attenuate frequency channels from said light.

14. (Currently amended) A method for achieving a blazed condition in a two-dimensional [[~~MEMS~~]] micromechanical grating device, comprising the alignment of the Fraunhofer envelope center, determined by the pixel pitch and tilt angle of said [[~~MEMS~~]] micromechanical grating device, with an optical diffraction order, further comprising the steps of:

for a given near monochromatic spatially coherent light at a given incident angle, θ_i, determining the angle for the n^{th} diffraction order of said light as

$$\sin(\theta_n) = \sin(-\theta_i) + n\lambda / d, \text{ where}$$

θ_n is the angle of the n^{th} diffraction order,

n is the diffraction order,

λ is the wavelength of said incident light, and

d is the pixel grating pitch of said [[~~MEMS~~]] micromechanical

grating device;

satisfying the blaze condition that $\sin(\theta_n) = \sin(\theta_F)$, where θ_F is the angle for the Fraunhofer envelope, to align the center of the Fraunhofer envelope center with diffraction order n, and further

$\theta_F = -\theta_i + 2\theta_t$, where θ_t is the tilt angle of the individual grating mirrors; and satisfying the condition

$$\theta_t(\theta_i, n) = 1/2 \{\arcsin [(n \lambda / d)\sqrt{2} - \sin(\theta_i)] + \theta_i \}.$$

15. (Currently amended) The method of Claim 14, wherein said [[~~MEMS~~]] micromechanical grating device is a ~~digital~~ micromirror device.

16. (Currently amended) The method of Claim 14, wherein[[:]] said incident light and 0th order reflected light are measured as:

θ_i and θ_r relative to said ~~DMD~~ micromirror grating device's array normal,

ϕ_i and ϕ_r relative to said ~~DMD~~ micromirror grating device's tilted mirror normal;

said diffraction orders are separated by equal distances along the x-axis, as given by

$x = \sin(\Psi(n))$, where Ψ is the diffraction order angle; and

the distance between the 0th diffraction order and the Fraunhofer envelope is a constant angle, that being equal to two times the tilt angle, θ_t.

17. (Original) The method of Claim 16, wherein the incident light, ϕ_i, and reflected light, ϕ_r, transverse the same path, further meeting the special conditions for Littrow blaze, which are

$\phi_i = \phi_r = 0$,

$\theta_i = \theta_t$, and

ϕ_i is that of a diffraction order, so that

$$\theta_t(n) = \arcsin(\lambda / d \cdot n / \sqrt{2}).$$

18. (Original) The method of Claim 17, wherein operation in the Littrow condition utilizes the same optics for said incident and said reflected light.

19. (Currently amended) The method of Claim 14 [[~~18~~]], wherein said Fraunhofer envelope

determines the amount of energy aligned with an n^{th} diffraction order, wherein:

said power is conserved; so that

for mirror tilt angle, θ_t, and pixel pitch, d, that aligns said Fraunhofer envelope center with a diffraction order, a blazed condition exists, providing available energy as a concentrated spot of light;

for flat mirrors the Fraunhofer envelope center aligns with the 0^{th} diffraction order, thereby yielding a blazed condition for said 0^{th} diffraction order; and

for mirror tilt angle and pixel pitch that aligns said Fraunhofer envelope center between diffraction orders, said energy is spread over multiple diffraction orders, lowering the intensity of said spot of light and thereby raising the background level of the signal.

20. (Currently amended) The method of Claim 19, wherein the Fraunhofer envelope for the light reflected off the pixel surfaces is given as the Fourier transform, $\Im$, of the aperture function, G, for a pixel (mirror) of the ~~DMD~~ micromirror device, the available orders being determined by the Fourier transform of the array of delta functions representing the array, written as

$\Im(F * G)$, which is equivalent to the product $\Im(F) \cdot \Im(G)$, giving

$\Im(F * G) = \Im(F) \cdot \Im(G)$.

21. (Currently amended) A ~~switchable two-dimensional blazed~~ micromechanical grating device~~, wherein the center of the Fraunhofer envelope is aligned with a optical diffraction order,~~ comprising:

a switchable two-dimensional matrix of reflective pixels, said individual pixels being capable of tilting in a positive and negative direction about a diagonal axis;

said pixel's pitch and tilt angle made to satisfy the conditions:

$\sin(\theta_n) = \sin(-\theta_i) + n\lambda / d$, where

θ_n is the angle of the n^{th} diffraction order,

n is the diffraction order,

λ is the wavelength of said incident light, and

d is the pixel grating pitch of said [[~~MEMS~~]] micromechanical grating

device;

$\sin(\theta_n) = \sin(\theta_F)$, where

θ_F is the angle for the Fraunhofer envelope to be aligned with one of the n diffraction orders;

$\theta_F = -\theta_i + 2\theta_t$, where

θ_t is the tilt angle of an individual pixel; and

$\theta_t(\theta_i, n) = 1/2\ \{\arcsin[(n\lambda / d)\sqrt{2} - \sin(\theta_i)] + \theta_i\}$

22. (Currently amended) The device of Claim 21, wherein said [[~~MEMS~~]] micromechanical grating device is a ~~digital~~ micromirror device.

23. (Original) The device of Claim 21, wherein said Fraunhofer envelope determines the amount of energy aligned with an n^{th} diffraction order, wherein:

said power is conserved; so that

for mirror tilt angle, θ_t, and pixel pitch, d, that aligns said Fraunhofer envelope center with a diffraction order, a blazed condition exist;

for flat mirrors the Fraunhofer envelope center aligns with the 0^{th} diffraction order, thereby yielding a blazed condition for said 0^{th} diffraction order; and

for mirror tilt angle and pixel pitch that aligns said Fraunhofer envelope center between diffraction orders, said energy is spread over multiple diffraction orders, lowering the intensity of said spot of light and thereby raising the background level of the signal.

24. (Currently amended) The device of Claim 23, wherein the Fraunhofer envelope for the light reflected off the pixel surfaces is given as the Fourier transform, $\Im$, of the aperture function, G, for a pixel (mirror) of the ~~DMD~~ micromirror device, the available orders being determined by the Fourier transform of the array of delta functions representing the array, written as

$\Im(F * G)$, which is equivalent to the product $\Im(F) \cdot \Im(G)$, giving

$\Im(F * G) = \Im(F) \cdot \Im(G)$.

25. (Currently amended) The device of Claim 24, wherein[[:]] said incident light and 0^{th} order reflected light are measured as:

θ_i and θ_r relative to said ~~DMD~~ micromirror device's array normal,

ϕ_i and ϕ_r relative to said ~~DMD~~ micromirror device's tilted mirror normal;

said diffraction orders are separated by equal distances along the x-axis, as given by

$x = \sin(x(n))$, where x is the diffraction order angle; and

the distance between the 0^{th} diffraction order and the Fraunhofer envelope is a constant angle, that being equal to two times the tilt angle, θ_t.

26. (Original) The device of Claim 25, wherein the incident light, ϕ_i, and reflected light, ϕ_r, transverse the same path, further meeting the special conditions for Littrow blaze, which are

$\phi_i = \phi_r = 0,$

$\theta_i = \theta_t$, and

ϕ_i is that of a diffraction order, so that

$\theta_t(n) = \arcsin(\lambda / d \cdot n / \sqrt{2})$.

27. (Currently amended) A system ~~for fiber optic/telecommunication switching/modulating applications,~~ comprising:

one or more near monochromatic spatially coherent light input signals coupled to an optical grating;

said optical grating converting said light into collimated channels of varying frequency, said collimated light being passed through condensing optics on to the surface of a ~~DMD~~ two-dimensional micromirror device;

said ~~DMD~~ micromirror device being fabricated with pixel pitch and tilt angle optimized to meet blazed operational conditions when used with near monochromatic spatially coherent light having a given wavelength and incident angle;

said ~~DMD~~ micromirror device being capable of switching, modulating, adding

frequency channels to, and removing frequency channels from, said light.

28. (Currently amended) The system of Claim 27, wherein said ~~DMD~~ micromirror device optimization is accomplished by:

aligning the Fraunhofer envelope center, determined by the pixel pitch and tilt angle of said ~~DMD~~ micromirror device, with a diffraction order, comprising the steps of:

for a given near monochromatic spatially coherent light at a given incident angle, θ_i, determining the angle for the n^{th} diffraction order of said light as

$$\sin(\theta_n) = \sin(-\theta_i) + n\lambda / d, \text{ where}$$

θ_n is the angle of the n^{th} diffraction order,

n is the diffraction order,

λ is the wavelength of said incident light, and

d is the pixel grating pitch of said [[~~MEMS~~]] micromechanical device;

satisfying the blaze condition that

$$\sin(\theta_n) = \sin(\theta_F),$$

where θ_F is the angle for the Fraunhofer envelope, to align the center of the Fraunhofer envelope center with diffraction order n, and further

$$\theta_F = -\theta_i + 2\theta_t,$$

where θ_t is the tilt angle of the individual grating mirrors; and

further satisfying the condition

$$\theta_t(\theta_i, n) = 1/2\ \{\arcsin[(n\lambda / d)\sqrt{2} - \sin(\theta_i)] + \theta_i\}$$

29. (Currently amended) The ~~method~~ system of Claim 28, wherein:

said incident light and 0^{th} order reflected light are measured as:

θ_i and θ_r relative to said ~~DMD~~ micromirror device's array normal,

ϕ_i and ϕ_r relative to said ~~DMD~~ micromirror device's tilted mirror normal;

said diffraction orders are separated by equal distances along the x-axis, as given by $x = \sin(x(n))$, where x is the diffraction order angle; and

the distance between the 0^{th} diffraction order and the Fraunhofer envelope is a constant angle, that being equal to two times the tilt angle, θ_t.

30. (Original) The system of Claim 29, wherein the incident light, ϕ_i, and reflected light, ϕ_r, transverse the same path, further meeting the special conditions for Littrow blaze, which are

$\phi_i = \phi_r = 0$,

$\theta_i = \theta_t$, and

ϕ_i is that of a diffraction order, so that

$\theta_t(n) = \arcsin(\lambda / d \cdot n / \sqrt{2})$.

31. (Original) The system of Claim 30, wherein operation in the Littrow condition utilizes the same optics for said incident and reflective light.

32. (Currently amended) The system of Claim <u>28</u> [[~~31~~]], wherein said Fraunhofer envelope determines the power aligned with an n^{th} diffraction order, wherein:

said power is conserved; so that for mirror tilt angle, θ_t, and pixel pitch, d, that aligns said Fraunhofer envelope center with a diffraction order, a blazed condition exist;

for flat mirrors the Fraunhofer envelope center aligns with the 0^{th} diffraction order, thereby yielding a blazed condition for said 0^{th} diffraction order; and

for mirror tilt angle and pixel pitch that aligns said Fraunhofer envelope center between diffraction orders, said energy is spread over multiple diffraction orders, lowering the intensity of said spot of light and thereby raising the background level of the signal.

33. (Currently amended) The system of Claim 32, wherein the Fraunhofer envelope for the light reflected off the pixel surfaces is given as the Fourier transform, $\Im$, of the aperture function, G, for a pixel (mirror) of the ~~DMD~~ <u>micromirror device</u>, the available orders being determined by the Fourier transform of the array of delta functions representing the array, written as

$\Im$ (F * G) , which is equivalent to the product $\Im(F) \cdot \Im(G)$, giving

$$\Im(F * G) = \Im(F) \cdot \Im(G).$$

34. (Currently amended) The system of Claim 33, wherein said system is used as a wave division multiplexer, wherein:

wavelength channels are reconfigured; and

~~any~~ subsets of wavelengths can be added or dropped.

35. (Currently amended) The system of Claim 33, wherein said system is used as a wave division, variable optical attenuator, wherein:

said ~~DMD~~ micromirror device mirrors are modulated to attenuate the signal by channel~~; and~~

~~the fast switching time of said system minimizes noise~~.

36. (Currently amended) The system of Claim 33, wherein said system is used as a tunable 1520-1580 nm laser, wherein:

each channel wavelength is produced using a single laser module; and

said ~~DMD~~ micromirror device tuned laser is tunable in gigahertz steps~~; and~~

~~said DMD micromirror device tuned laser is 10,000 times faster than comparable mechanical lasers~~.